

PAYLOAD SAFETY PROCESS

**OPERATIONS SUPPORT FOR THE
NASA BALLOON PROGRAM
CONTRACT No. NAS5-03003**

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REV A**

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**NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION**

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NOTICE: Document follows.

TABLE OF CONTENTS

| | |
|--|---|
| Table of Contents..... | 2 |
| List of Tables..... | 2 |
| 1 General | 3 |
| 2 Initiate Project and Document Safety Assessment..... | 4 |
| 2.1 Identify Hazards Falling Within CSBF Ground Safety Plan | 4 |
| 2.2 Identify Hazards Falling Outside CSBF Ground Safety Plan | 4 |
| 2.3 User Verification of Compliance with CSBF Ground Safety Plan..... | 5 |
| 2.4 User Prepared Special Safety Plans | 5 |
| 3 Conduct Safety Reviews..... | 5 |
| 3.1 Review Standard and Special Payload Safety Issues and Plans..... | 5 |
| 3.2 Resolve Open Safety Concerns, Action Items, and Discrepancies..... | 5 |
| 4 Finalize and Approve Safety Assessments/Plans | 5 |
| 4.1 Prepare Balloon System Prelaunch Safety Package (BSPSP) | 5 |
| 5 Periodic Compliance Checks..... | 6 |
| 5.1 Verify Compliance with Safety Procedures/Plans | 6 |
| 6 Prelaunch Review | 6 |
| 6.1 Review Applicable Safety Plans with Flight Line Personnel | 6 |
| 6.2 Recovery Plan..... | 6 |
| 7 Documentation | 6 |
| 8 Change Log..... | 7 |

LIST OF TABLES

| | |
|--|---|
| Table 1 Payload Safety Process | 3 |
| Table 2 Payload Safety Process Documentation | 6 |

1 GENERAL

This document outlines the Columbia Scientific Balloon Facility's (CSBF) process of certifying and documenting that a balloon payload complies with applicable safety requirements during integration and launch. It addresses the tasks, responsibilities, submittals, safety reviews/meetings, and schedules associated with the process. The philosophy of the CSBF payload safety process is that the CSBF scientific user is responsible for insuring that the payload complies with CSBF policy. CSBF is responsible for checking, monitoring, and documenting compliance.

From a safety standpoint, payloads flown by NASA's Balloon Program pose reduced risks in comparison to other NASA Expendable Launch Vehicles. Hazards associated with balloon payloads fall into a somewhat limited and generic set of safety considerations. Standard safety hazards in ballooning can be categorized as follows.

- Radioactive Sources
- Lasers
- Chemical Hazards
- Pressure Vessels
- High Voltage
- Contained Pyrotechnics

Safety compliance requirements for the above hazards are addressed in the *NASA Balloon Program Ground Safety Plan*. Identified safety hazards that fall outside these areas are handled through separate safety plans and reviews. The following sections describe the process. Table 1 is an abbreviated depiction of the CSBF Payload Safety Process.

Table 1 Payload Safety Process

| TASK | SAFETY TASK DESCRIPTION | RESPONSIBILITY | REFERENCE PARAGRAPH | SCHEDULE |
|--|---|-------------------------|---------------------|--|
| Initiate Project and Document Safety Assessment | | | | |
| 1 | Identify safety hazards falling within <i>CSBF Ground Safety Plan</i> | CSBF Operations Manager | 2.1 | 3-9 Months before payload ships to launch site |
| 2 | Identify safety hazards falling outside of standard <i>CSBF Ground Safety Plan</i> | CSBF Operations Manager | 2.2 | 3-9 Months before payload ships to launch site |
| 3 | User prepared special safety plan for hazards not covered in <i>CSBF Ground Safety Plan</i> | Principle Investigator | 2.3.1 | 1 Month before payload ships to launch site |

| TASK | SAFETY TASK DESCRIPTION | RESPONSIBILITY | REFERENCE PARAGRAPH | SCHEDULE |
|--|--|--|---------------------|---|
| Conduct Safety Reviews | | | | |
| 1 | Review standard and special payload safety issues and plans | CSBF Site Manager/Operations Manager | 3.1 | Beginning three months before payload ships to launch site |
| 2 | Resolve open safety concerns, action items and discrepancies | CSBF Operations Manager | 3.2 | As assigned |
| Finalize and Approve Safety Assessments and Plans | | | | |
| 1 | Prepare final Balloon System Prelaunch Safety Package | CSBF Operations Manager / Campaign Manager | 4.1 | Immediately following arrival at launch site |
| Periodic Compliance Checks | | | | |
| 1 | Verify that procedures / plans are being followed. | CSBF Operations Manager / Campaign Manager | 5.1 | Periodic from payload arrival at launch site through launch |
| Prelaunch Review | | | | |
| 1 | Review applicable routine and special safety issues and plans with flight line personnel | CSBF Flight Director | 6.1 | < 72 hours before launch |
| 2 | Recovery Plan | CSBF Flight Director | 6.2 | < 72 hours before launch |

2 INITIATE PROJECT AND DOCUMENT SAFETY ASSESSMENT

2.1 IDENTIFY SAFETY HAZARDS FALLING WITHIN CSBF GROUND SAFETY PLAN

The CSBF Flight Application Form is sent out to prospective users in July of each year. The form includes a safety questionnaire covering hazards normally associated with balloon payloads. The CSBF Ground Safety Plan is available on the CSBF website so the prospective user can identify safety issues and determine whether the payload complies with CSBF policy.

2.2 IDENTIFY SAFETY HAZARDS FALLING OUTSIDE CSBF GROUND SAFETY PLAN

The Flight Application also contains questions about safety hazards not covered in the Ground Safety Plan whereby special cases are identified and flagged. The Flight Application requests that the user forward all home institution safety documentation to CSBF. Most balloon payloads originate at NASA centers or universities. Users are usually required to undergo rigorous safety processes at their home institutions while building up their instrumentation. This documentation is used by CSBF as a further check of compliance with safety requirements.

2.3 USER VERIFICATION OF COMPLIANCE WITH CSBF GROUND SAFETY PLAN

The principle investigator is required to submit signed documentation indicating that the payload complies with CSBF safety standards delineated in the *CSBF Ground Safety Plan*. This form is sent to CSBF prior to shipment of the payload to the launch site.

2.3.1 User Prepared Special Safety Plans

When the user identifies a safety issue falling outside those covered in the *CSBF Ground Safety Plan* (i.e. superconducting magnet, toxic gas, etc), a separate safety plan must be prepared by the user and submitted to CSBF for review. The CSBF Safety Officer is responsible for review of these plans for compliance with established industry safety standards.

3 CONDUCT SAFETY REVIEWS

3.1 REVIEW STANDARD AND SPECIAL PAYLOAD SAFETY ISSUES AND PLANS

Program Review Meetings are held monthly at CSBF to discuss support of upcoming campaigns and operations. Flight Applications and project files are reviewed in some detail. Safety related status, concerns, and issues are discussed. Action items on safety compliance are documented and tracked.

3.2 RESOLVE OPEN SAFETY CONCERNS, ACTION ITEMS, AND DISCREPANCIES

Response and close of safety related action items for each upcoming operation are discussed at the monthly Program Review Meetings. Closing of action items are the responsibility of the Operations Manager or the assigned Campaign Manager. Emphasis is placed on insuring that applicable safety documentation is at CSBF prior to shipping the instrumentation to the launch site.

4 FINALIZE AND APPROVE SAFETY ASSESSMENTS/PLANS

4.1 PREPARE BALLOON SYSTEM PRELAUNCH SAFETY PACKAGE (BSPSP)

Immediately following the scientist's arrival at the launch site, a Flight Requirements Meeting is held. The Flight Application Form is reviewed for compliance with standard and special safety issues prior to beginning of payload integration. The signed Payload Safety Compliance form, special safety plans for non-standard hazards, and user institution safety documentation is reviewed, discussed, and assembled into the Balloon System Prelaunch Safety Package (BSPSP). Unresolved issues, if any are referred to the CSBF Safety Officer. The completed BSPSP package serves as a formal approval of the project from a safety standpoint.

5 PERIODIC COMPLIANCE CHECKS

5.1 VERIFY COMPLIANCE WITH SAFETY PROCEDURES/PLANS

The CSBF Operations Manager or Campaign Manager is responsible for periodic inspection of integration areas for compliance with routine and special safety procedures and plans. These inspections will typically take place on at least a bi-weekly basis.

6 PRELAUNCH REVIEW

6.1 REVIEW APPLICABLE SAFETY PLANS WITH FLIGHT LINE PERSONNEL

Flight Readiness Review meetings are held once the science payload is flight ready and no sooner than 72 hours prior to a scheduled launch. Standard flight line payload safety procedures and special safety plans, if any, are reviewed with cognizant personnel. Checklists are used to insure safety compliance. These meetings are rescheduled every 72 hours should a launch delay occur.

6.2 RECOVERY PLAN

A completed form indicating step-by-step instructions for safe payload handling during recovery operations is submitted by the principle investigator at the Flight Readiness Review meeting. This form is reviewed and approved by the Flight Director. Should extraordinary safety measures be necessary during recovery, a formal plan is written, reviewed, and discussed with recovery personnel.

7 DOCUMENTATION

Table 2 lists documentation generated during the Payload Safety Process, who is responsible for generating it, and required signatures on the accompanying documentation. At the conclusion of each flight, all payload safety documentation will be archived in the flight folder.

Table 2 Payload Safety Process Documentation

| DOCUMENT | RESPONSIBLE PARTY | REQUIRED SIGNATURES |
|--|-------------------------|--|
| Flight Application | Principal Investigator | Principal Investigator |
| Special safety plans | Principal Investigator | Principal Investigator |
| User institution safety documentation | Principal Investigator | User Institutional Safety Office Representative |
| Verification of Safety Compliance form | Principal Investigator | Principal Investigator / CSBF Operations Manager |
| Program Review meeting action item and closure | CSBF Operations Manager | CSBF Operations Manager |
| Balloon System Prelaunch Safety Package | CSBF Campaign Manager | CSBF Campaign Manager |

| DOCUMENT | RESPONSIBLE PARTY | REQUIRED SIGNATURES |
|---------------------------------------|------------------------|--|
| Preflight Readiness meeting checklist | CSBF Flight Director | CSBF Flight Director |
| CSBF Recovery form | Principal Investigator | Principal Investigator / CSBF Operations Manager |

8 CHANGE LOG

| CHANGE SUMMARY | REVISION | RELEASE DATE |
|---|----------------|-------------------|
| Baseline Release | Original Issue | February 6, 2003 |
| - Changed "National Scientific Balloon Facility" to "Columbia Scientific Balloon Facility" and "CSBF" to "CSBF" throughout text | A | February 13, 2007 |